



Display & Recording Devices

- CRT •
- Display Storage Tube •
- Flat Panel •

Display Storage Tubes

For display diameters up to about 7 inches, the display storage tube is usually the most cost effective device for presenting both television and radar information on the same display. Westinghouse High Contrast DSTs, while retaining the high brightness, controllable persistence features of conventional DSTs, provide increased gray shades and higher contrast through the elimination of erase background. There's no need for high voltage pulsing (dunking). A recent development makes these High Contrast tubes available, at customer option, with twice standard brightness at no increase in screen voltage.

The types listed below are electrostatically focussed and provided with encapsulated high voltage cables. Voltages are given with respect to the flood gun

cathode which is assumed to be at ground potential. All types are fully potted and supplied with a magnetic shield except the 7183A and 31720.

Characteristics listed are selected to optimize one or more parameters such as storage time, writing speed, resolution, etc. To discuss the optimization of parameters in your application, please contact Westinghouse.

NOTES:

- * Factory collimated, voltage shown is a required input (positive and/or negative).
- Δ Storage area.
- Non-storage area.
- a. At radar sweep and erase rate.
- b. At television sweep and erase rates.
- c. Control electrode voltage.
- d. Time required for the visual output to increase from visual cutoff to 10% of saturated luminance without application

of a writing signal or erase pulse.

- e. The width of a single rectangular erase pulse, one volt greater than backing electrode cutoff which erases the display from saturated luminance to visual extinction.
- f. The difference between the amplitude of an erase pulse required to illuminate any area of an unwritten screen and the amplitude of an erase pulse required to evenly illuminate the screen is the Erasing Uniformity (Δep).
- g. The 8931 (MIL-E-1/1711) is the JEDEC-registered version of the WX-5444.
- h. The 8832 (MIL-E-1/1681) is the JEDEC-registered version of the WX-31016.
- i. The WX-31748, except for its installed electrical connector kit and vibration isolator, is identical to the WX-5308.
- j. The WX-31832, except for its installed electrical connector kit, is identical to the WX-5047.
- k. The 7268B (MIL-E-1/1591A) is the factory pre-collimated version of the 7268A (MIL-E-1/1505B).

ELECTROSTATIC DEFLECTION - HIGH CONTRAST

TYPE NUMBER	31931	31998	4951	5444 8931	30533A	30593	30808	30930	31016 8832	31933	32148	32504	31368
Outline Drawing	A	B	C	D	D	E	D	F	K	K	D	G	H
Minimum Useful Viewing Diameter (inches/cm)	2.25/ 5.72	3/ 7.62	4/ 10.16	4/ 10.16	4/ 10.16	4/ 10.16	4/ 10.16	4/ 10.16	4/ 10.16	4/ 10.16	4/ 10.16	4/ 10.16	5.5/ 13.97
Number of Write Guns	1	1	1	2	2	1	2	1	2	2	2	1	2
Type of Focus	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES
Gas Viewing Duration (Seconds) Note d	20	15	15	30	30	30	15	30	15	15	15	30	20
Minimum Writing Speed (in/sec)/(cm/sec)	$5 \times 10^5 /$ 1.27×10^5	$6 \times 10^4 /$ 1.52×10^5	$1 \times 10^5 /$ 2.5×10^5	$3.6 \times 10^4 /$ 9.14×10^4	$3.6 \times 10^4 /$ 9.14×10^4	$1 \times 10^5 /$ 2.54×10^5	$7.2 \times 10^4 /$ 1.83×10^5	$5 \times 10^3 /$ 1.27×10^4	$7.2 \times 10^4 /$ 1.83×10^5	$7.2 \times 10^4 /$ 1.83×10^5	$7.2 \times 10^4 /$ 1.83×10^5	$3 \times 10^4 /$ 7.62×10^4	$4.5 \times 10^4 /$ 1.14×10^5
Typical Erase Time (Milliseconds) Note e	5	2 to 4	30	18	10	12	5	70	5	5	4	10 to 20	7
Minimum Display Luminance (F.T.-L)	2000	800	1200	1500	1500	1000	1800	400/10°	1800	4000	3000	4000	1000
Minimum Center Shrinking Raster Resolution (Lines/in.)/(Lines/cm)	125/ 49.2	50/ 19.7	60/ 23.6	60/ 23.6	65/ 25.6	60/ 23.6	70/ 27.6	50/ 19.7	70/ 27.6	80/ 31.5	95/ 37.4	95/ 37.4	70/ 27.6
Erase Uniformity (Δep) Note f	—	—	1.0	—	—	—	—	—	—	—	—	1.0	—
Brightness Levels (Gray Scales)	7b	5b	6b	7b	7b	7b	7b	5b	7b	7b	8b	8	7b
Screen Voltage (Kilovolts)	10	8	10	10	10	10	10	8	10	10	10	10	10
Backing Electrode Volts	15	7	10	15	15	12.5	15	12	15	15	6	6	15
Collector Volts	250	200	200	250	250	200*	265	120	265*	265*	250	200	250
Collimator C Volts (Typical)	100	45	60	80	80	—	80	40	—	—	80	65	100
Collimator D Volts (Typical)	—	—	—	—	—	—	—	—	—	—	—	—	70
Collimator E Volts (Typical)	—	—	—	—	—	—	—	-5c	—	—	—	—	—
Control Grid 1 Flood Gun (Volts)	0 to -50	0 to 10	0 to -50	0	0	0 to -50	0 to -50	0 to -50	-100*	-100*	0 to -15	0 to -15	0 to -30
Write Grid 2 & 4 Volts	75 to 125	50	90 to 110	100	100	120	90 to 110	100	90 to 110	90 to 110	100	60	90 to 110
Write Grid 3 Focus (Volts)	-1350 to -1760	-395 to -415	-2000 to -2300	$10.8 \pm 0.15\%$ WG 2-4	$10.8 \pm 0.15\%$ WG 2-4	-1800 to -2100	-2000 to -2300	-1600 to -2300	-2000 to -2300	-2000 to -2300	-1484 to -1513	-1500 (typ)	-1200 to -1400
Write Grid 1 Cutoff Range (Volts)	-1750 to -1830	-510 to -518	-2400 to -2470	-945 to -975	-1165 to -1215	-2400 to -2425	-2400 to -2500	2460 to -2500	-2460 to -2500	-2400 to -2500	-1740 to -1775	-1750 (typ)	-1600 to -1670
Write Cathode Volts	-1750	-500	-2400	-900 nom	-1100 nom	-2400	-2400	-2500	-2400	-2400	-1700	-1700	-1600
Deflection Factor (V/in/KV)/(V/cm/KV)	40 to 65/ 15.75 to 25.59	49 to 57/ 19.29 to 22.44	28 to 35/ 11.02 to 13.78	35/ 13.78	35/ 13.78	28 to 35/ 11.02 to 13.78	33 to 40/ 13 to 15.75	25 to 35/ 9.84 to 13.78	33 to 40/ 13 to 15.75	33 to 40/ 13 to 15.75	33 to 40/ 13 to 15.75	33 to 40/ 13 to 15.75	14 to 35/ 5.51 to 13.78
Suppressor Electrode Volts	75	82	75	75	75	75	75	75	75	75	250	200	75
Comments	Compact	Compact High Contrast	High Contrast	Precision Deflection System	Radar and Television Capability	High Writing Speed	Radar and Television Capability	Split Screen (CRT/DST)	Radar and Television	High Brightness	High Quality TV-Radar Performance	High Resolution High Brightness	Large Display Dual Gun

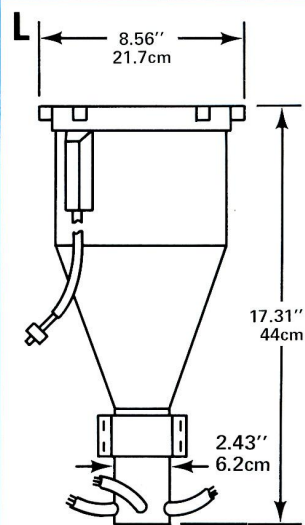
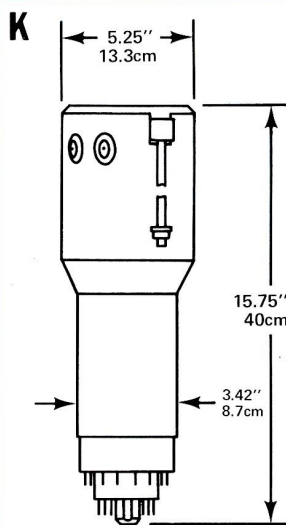
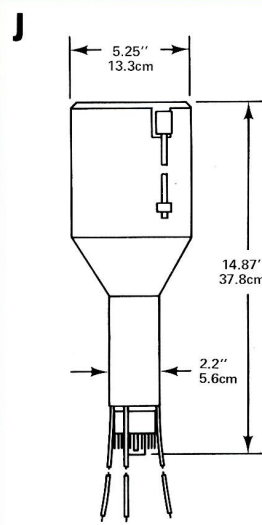
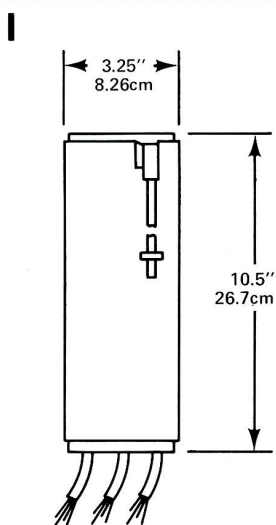
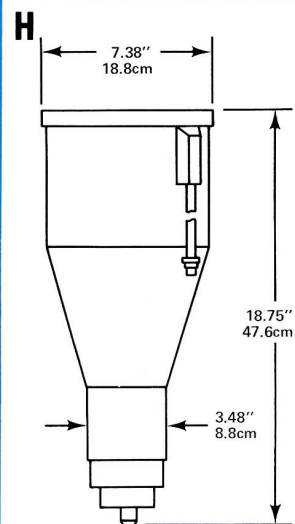
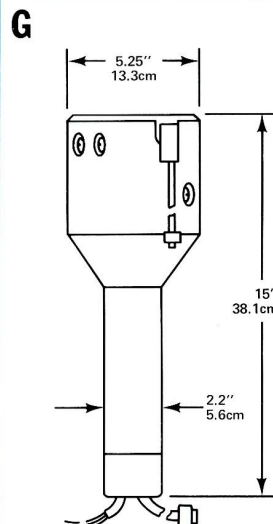
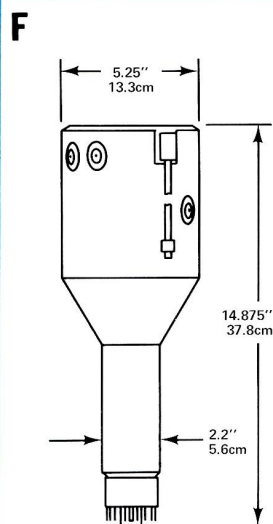
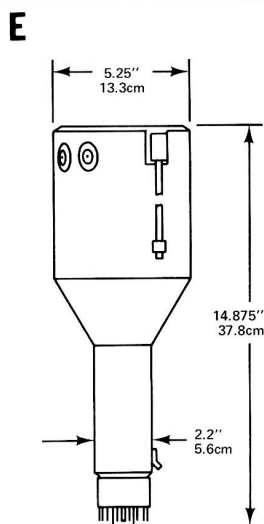
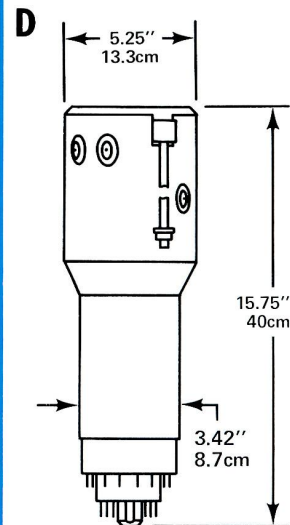
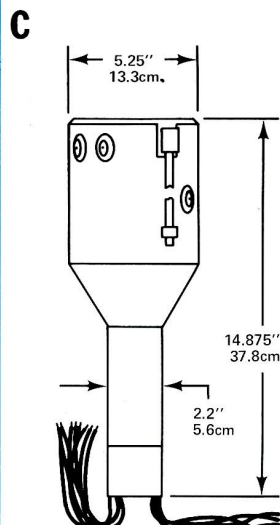
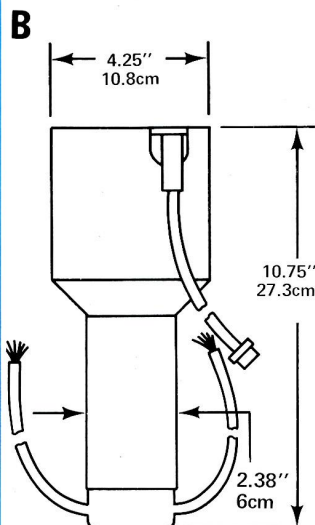
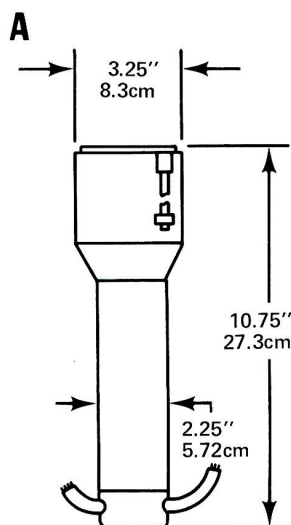
ELECTROSTATIC DEFLECTION - STANDARD

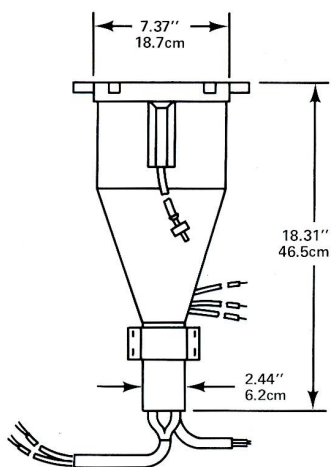
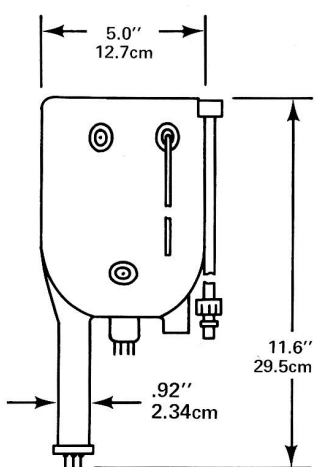
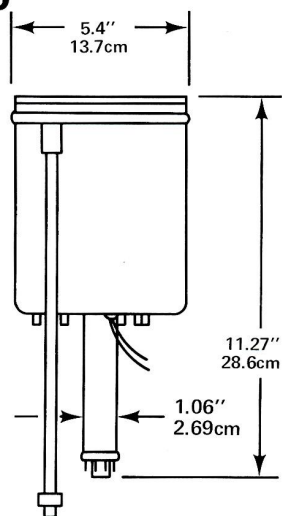
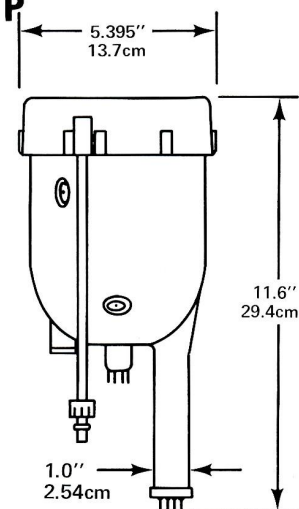
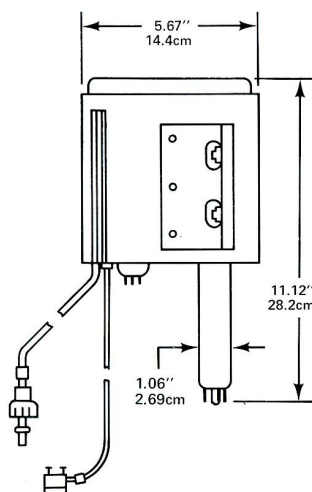
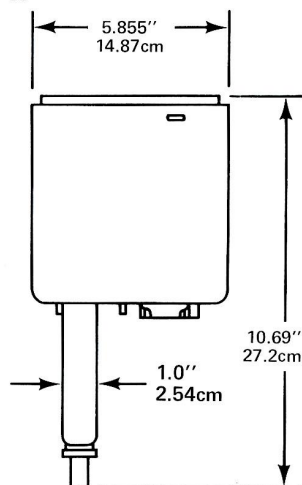
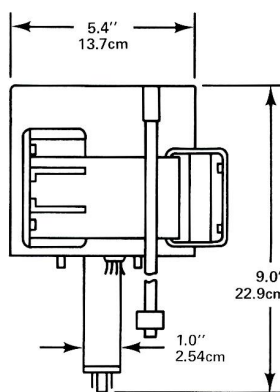
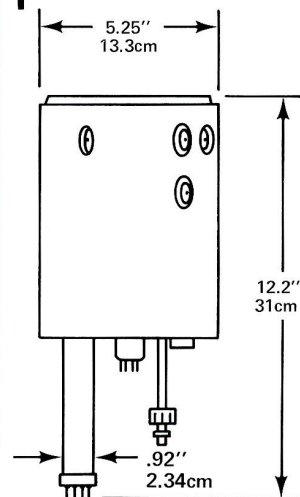
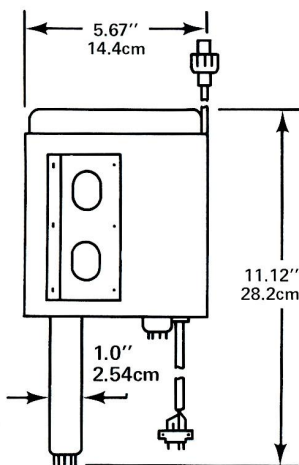
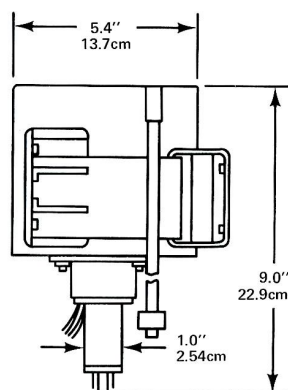
TYPE NUMBER	30059	5308 31748	5047 31832	5314	7268A	7268B	32217	31684	30154
Outline Drawing	I	B	C	J	D	K	K	L	M
Minimum Useful Viewing Diameter (inches/cm)	2.25/ 5.72	3/ 7.62	4/ 10.16	4/ 10.16	4/ 10.16	4/ 10.16	4/ 10.16	5.7/ 14.48	5.8/ 14.73
Number of Write Guns	2	1	1	1	2	2	2	1	1
Type of Focus	ES	ES	ES	ES	ES	ES	ES	ES	ES
Gas Viewing Duration (Seconds) Note d	10	30	10	60	15	15	15	30	40
Minimum Writing Speed (in/sec)/(cm/sec)	$5 \times 10^4 / 1.27 \times 10^5$	$1 \times 10^4 / 2.54 \times 10^4$	$4 \times 10^5 / 1.02 \times 10^6$	$1 \times 10^4 / 2.54 \times 10^4$	$4 \times 10^4 / 1.02 \times 10^5$	$4 \times 10^4 / 1.02 \times 10^5$	$4 \times 10^4 / 1.02 \times 10^5$	$4.5 \times 10^5 / 1.14 \times 10^6$	$5 \times 10^4 / 1.27 \times 10^5$
Typical Erase Time (Milliseconds) Note e	7	45	40	75	45	45	15 to 45	4	100
Minimum Display Luminance (FT-L)	500	1000	1000	200	2200	2200	4500	1000	750
Minimum Center Shrinking Raster Resolution (lines/in)/(lines/cm)	130/ 51	50/ 19.7	90/ 35.4	90/ 35.4	70/ 27.6	70/ 27.6	70/ 27.6	70/ 27.6	45/ 17.7
Erase Uniformity (Δep) Note f	1.0	1.0	1.0	1.0	1.1	—	—	—	1.4
Brightness Levels (Gray Scales)	4a	4a	4a	4a	4a	4a	4a	4a	4a
Screen Voltage (Kilovolts)	5	8	10	5	10	10	10	10	10
Backing Electrode Volts	4	2	2	2	2	2	2	6	2
Collector Volts	160	200	200	200	265	265*	265*	250	210
Collimator C Volts (Typical)	40	40	60	60	80	—	—	90	75
Collimator D Volts (Typical)	—	—	—	—	—	—	—	55	70
Control Grid 1 Flood Gun (Volts)	0 to -50	0 to -10	0 to -50	0 to -50	0 to -50	-100*	-100*	0 to -35	0
Write Grid 2 & 4 Volts	90 to 110	40 to 50	25 to 75	90 to 110	95 to 105	95 to 105	95 to 105	150 to 170	160
Write Grid 3 Focus (Volts)	-1200 to -1500	-395 to 415	-1850 to -2150	-2000 to -2300	-1975 to -2150	-1975 to -2150	-1975 to -2150	-1300 to -1700	-1600 to -2000
Write Grid 1 Cutoff Range (volts)	-1510 to -1550	-512 to -518	-2500 to -2570	-2400 to -2470	-2460 to -2500	-2460 to -2500	-2460 to -2500	-1700 to -1775	-2560 to -2590
Write Cathode Volts	-1500	-500	-2500	-2400	-2400	-2400	-2400	-1700	-2500
Deflection Factor (V/in/kv) (V/cm/kv)	12 to 50/ 4.72 to 19.69	50 to 57/ 19.69 to 22.44	28 to 35/ 11.02 to 13.78	28 to 35/ 11.02 to 13.78	33 to 40/ 13 to 15.75	33 to 40/ 13 to 15.75	33 to 40/ 13 to 15.75	14 to 35/ 5.51 to 13.78	18 to 30/ 7.09 to 11.81
Comments	Compact Dual Gun	Compact	High Resolution	Long Gas Viewing Duration	Available With Factory Collimation	Factory Collimated	High Brightness	Large Display High Writing Speed	Large Viewing Area

MAGNETIC DEFLECTION

TYPE NUMBER	7183A	30811	31411	31412	31461	31720	31724	31734	31805	31829	31926	32614	32790
Outline Drawing	N	O	O	O	O	P	Q	R	S	T	U	V	Q
Minimum Useful Viewing Diameter (inches/cm)	4/ 10.16	4/ 10.16	4/ 10.16	4/ 10.16	4/ 10.16	4/ 10.16	4/ 10.16	4/ 10.16	4/ 10.16	4/ 10.16	4/ 10.16	4/ 10.16	4/ 10.16
Number of Write Guns	1	1	1	1	1	1	1	1	1	1	1	1	1
Type of Focus	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES
Gas Viewing Duration (Seconds) Note d	15	30	15	15	15	10	30	30	30	30	30	30	30
Minimum Writing Speed (in/sec)/(cm/sec)	$1.2 \times 10^4 / 3.05 \times 10^4$	$7 \times 10^4 / 1.78 \times 10^5$	$7 \times 10^4 / 1.78 \times 10^5$	$5.6 \times 10^4 / 1.4 \times 10^5$	$7.5 \times 10^4 / 1.9 \times 10^5$	$7 \times 10^4 / 1.78 \times 10^5$	$3 \times 10^4 / 7.62 \times 10^4$	$1 \times 10^4 / 2.54 \times 10^4$	$1 \times 10^5 / 2.54 \times 10^5$	$9 \times 10^4 / 2.3 \times 10^5$	$2.5 \times 10^5 / 6.35 \times 10^5$	$1 \times 10^5 / 2.54 \times 10^5$	$3 \times 10^4 / 7.62 \times 10^4$
Typical Erase Time (Milliseconds) Note e	40	3	3	3	1.5	2	20	30	20 (max.)	3	13	5 to 10	10 to 20
Minimum Display Luminance (FT-L)	700	1000	800	1000	1000	1000	500	180	1000	1200	1200	1000	500
Minimum Center Shrinking Raster Resolution (Lines/in)/(Lines/cm)	45/ 17.7	100/ 39.4	100/ 39.4	120/ 47	150/ 59	80/ 31.5	50/ 19.7	55/ 21.6	85/ 33.5	130/ 51	77/ 30	85/ 33.5	50/ 19.7
Brightness Levels (Gray Scales)	4a	9b	8b	8b	8b	8b	4a	3a	7b	7b	4a	7b	5a
Screen Voltage (Kilovolts)	8.5	9.5	9.5	10	10	8.5	6	7.5	8	10	8	8	6
Backing Electrode Volts	0	5 to 12	5 to 12	5 to 12	5 to 12	0	1 to 5	5	5 to 12	0	0 to 5	5 to 12	1 to 5
Collector Volts	250	80	100	200	200	200	120	115	35 to 40	200	120	35 to 40	120
Collimator C Volts (Typical)	80 to 110	20 to 45	20 to 50	—	—	65 to 105	20 to 40	35 to 75	0 to 25	65 to 105	20 to 40	0 to 25	2 to 40
Collimator D Volts (Typical)	10 to 38	15 to 45	15 to 45	—	—	15 to 55	0 to 30	10 to 30	0 to 20	—	—	0 to 20	0 to 30
Collimator E Volts (Typical)	100	5 to 30	5 to 30	—	—	110	80	75	15 to 30	110	80	15 to 30	80
Control Grid 1 Flood Gun (Volts)	0 to -35	0 to -20	0 to -20	0 to -20	0 to -20	0 to -35	0 to -30	0 to -30	0 to -15	0 to -30	0 to -30	0 to -15	0 to -30
Write Grid 2 & 4 Volts	—	50	95	—	—	—	—	WG2 only -1600	—	10 to 40	5	—	—
Write Grid 3 Focus (Volts)	-1600 to -1900	-1300 to -1500	-1300 to -1500	-1100 to -1300	-1100 to -1300	-1600 to -1900	-1050 to -1325	WG4 only -1865 to -2100	-1050 to -1400	-1900 to -2200	-1750 to -2150	-1050 to -1400	-1050 to -1375
Write Grid 1 Cutoff Range (Volts)	-2500 to -2630	-1730 to -1760	-1730 to -1760	-1530 to -1560	-1530 to -1560	-2500 to -2630	-1520 to -1550	-1815 to -1845	-1525 to -1590	-3070 to -3130	-2535 to -2560	-1525 to -1590	-1520 to -1550
Write Cathode Volts	-2500	-1700	-1700	-1500	-1500	-2500	-1500	-1800	-1500	-3000	-2500	-1500	-1500
Suppressor Electrode Volts	—	—	—	—	—	—	—	—	—	75	—	—	75
Comments	Weather Radar Capabilities	Radar & TV Capabilities	Radar & TV Capabilities	Radar & TV Capability, Factory Collimated	High Resolution	Weather Radar & TV Capability	Extendable Storage Time Capability	Enhanced Contrast Display	Compact	High Resolution, High Contrast	Airborne Weather Radar	Tube-Yoke Package	High Contrast WX-31724

Outline Diagrams for Display Storage Tubes



M**N****O****P****Q****R****S****T****U****V**

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TECHNICAL LITERATURE LIST

Individual Data Sheets

Detailed technical data sheets covering electrical, optical, mechanical, and typical operating conditions. Order by type number.

I & M Cathode Ray Tube Manual

Complete data on all tubes listed in the Quick Reference Guide. Automatically updated as new products are released.

RFQ application questionnaire to guide you in specifying a custom CRT.

CRF-851

Notes On The Use Of Westinghouse

High Resolution Cathode Ray Tubes

Discussion of the many conditions that affect optimum performance of high resolution cathode ray tubes.

ETD-6103

Optimum Start-Up Procedures for

Maximum Reliability of High Resolution Cathode Ray Tubes

Notes on the proper sequence of applying and removing voltages to avoid possible injury to a high resolution CRT.

ETD-6301

Dynamic Focus Of High Resolution Cathode Ray Tubes

Requirements necessary for dynamic focus circuits to maintain minimum spot size in different types of displays.

ETD-6102

Cathode Ray Tube Cut-Off Conversion

Methods for determining the cut-off of a CRT in your circuit to best match video drive.

ETD-6106

Comparison of Various Types of Resolution Measurement

Covers shrinking raster, television test patterns, and sine wave response measurements.

ETD-6402

Visual Measurement Of Spot Size for High Resolution Cathode Ray Tubes

Factors entering into visual methods of spot size determination.

ETD-6104

Measuring Spot Size of High Resolution Cathode Ray Tubes

Detailed explanation of the slit scan approach allowing accurate reproducibility of .0005 inch readings at the 10 percent amplitude points.

ETD-5510

Fiber Optics And Their Application to Electron Tubes

Covers materials, properties, cladding, resolution and other points of concern in detail.

ETD-1258

Phosphors Available For Use in Westinghouse Military And Industrial Display Tubes

Booklet containing individual spectral energy distribution curves, persistence curves and other data on the phosphors used in industry today.

ETD-6101

Creation of Contrast on a Cathode Ray Tube

Methods of enhancing display contrast and readability.

ETD-SA-1031

Applications Guide to Display Storage Tube Parameters

Discussion of operating procedures for DSTs.

ETD-6337

Technical literature is available from your local representative or from:

Westinghouse Electric Corp.
I & G Tube Division
Westinghouse Circle
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Technical Services at  ETD (SA-148)